

DOCUMENT DESCRIPTION (Completed By Requesting Division)

Document No.

ms/chR2-0048/DEL REV

Author's Telephone No.

6-0263

Acct. No.

23660003

Date of Request

3/3/95

Unclassified Title:

REPORTS - I CONCENTRATIONS (#2108-13)

Author(s): Requestor: Steve Wiley

TYPE: ☐ Formal Report ☐ Informal Report ☐ Progress/Status Report ☐ Co-Op Report ☐ Thesis/Term Paper☐ Oral Presentation (identify meeting, sponsor, location, date):☐ Journal Article (Identify Journal):☒ Other (Specify): To Be Released to ChemRisk, Phase IIDocument will be published in proceedings ☒ No ☐ YesDocument will be distributed at meeting ☒ No ☐ YesDocument has patent or invention significance ☐ No ☐ Yes (Identify)Document has been previously released ☒ No ☐ Yes (Reference)

DIVISION REVIEW AND APPROVAL (Completed By Requesting Division)

TECHNICAL CLASSIFICATION REVIEW (Divisional Classification Representative)

Title(s): WILEY U Abstract: N.A.DOCUMENT: Level WILEY C Category WILEY A. RDSignature H.B. Hickman Date 3-7-95
(BRACKETED)

DOCUMENT REQUEST APPROVED (Division or Department)

Signature [Signature] Date 3/3/95

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Y-12 Central Files Y-12 RC Y-12 RC Y-12 RC

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Distribution Remarks: Cleared for Public Release / Open Net
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APPROVAL AND RELEASE

Date Received

Date Initiated

3/3/95

☒ CLASSIFICATIONS:Title(s): U Abstract NA

DOCUMENT:

Level U (w/ del) Category _____Weapons Data NA Sigma NASignature R.E. Fraser Date 3-10-95
Y-12 Classification Office☐ Editor _____ Date _____☒ Patent Office [Signature] Date _____☐ _____ Date _____☐ _____ Date _____APPROVED FOR: ☐ Declassification ☐ Release subject to use of the following admonitory markings and conditions:☐ Disclaimer ☐ Copyright ☐ Patent Caution ☐ Other

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REPORTS - T Concentration

REPORTS
2005-2006
T Concentration

h-7-117

Rep # 2418

TABLE 4

ESTIMATED LOSS OF AIR-BORNE T-DUST PER 24 hrs., BLDG. 9202

Area Sampled	Loss Thru Settling (Petri-Dish)			Loss Thru Mech. Vent.			Loss Thru Nat. Vent.		
	Floor Area (Sq. Ft.)	Ave. Cono. Per Day (MG/Sq.Ft./Day)	Total Settled Per Day (G/Day)	Air Volume (CFM)	Ave. Cono. (/m ³)	Total Carried Off (G/Day)	Air Volume (EST.) (CFM)	Ave. Cono. (/m ³)	Total Carried Off (G/Day)
Bulk Treatment 1st Floor 2nd " 3rd "	7093	5.3	36	13,410	217	119	30,000	64	79
	6148	24.3	148	10,000	94	38	30,000	176	216
	6463	12.3	80	5,000	78	16	30,000	78	97
Sublimation East West	2850	4.0	11	12,000	45	22	10,000	45	18
	2720	4.0	10	10,000	28	11	10,000	28	11
Charge Filling	1100	118.0	130	10,000	117	47	5,000	117	24
Bottle Filling	140	No Samp.	---	400	115	2	0	---	---
TOTAL			415 G	255 G			445 G		

TABLE 7

LOSSES OF AIR-BORNE T DUST. 2nd FLOOR BLDG. 9201-1

Area Sampled	LOSS THROUGH SETTLING			LOSS THROUGH VENT		
	Floor Area (Sq. Ft.)	Ave. Conc. Per Day MG/Sq. Ft./Day	Total Settled Per Day G/Day	Air Volume (CFM)	Ave. Conc. $\mu\text{G}/\text{m}^3$	Total Carried Off G/Day
Mech. Serv., Chem. Recov., Vac. Testing	14,680	1.5	22	115,404	28	120
Carbon Burning (First Floor 2 Rooms)	1,400	1.3	1.8	5,000*	167	34
			TOTAL		23.8	154

* This is estimated.

ESTIMATED LOSS OF AIR-BORNE T-DUST PER 24 hrs., BLDG. 9204-1

Area Sampled	Less Thru Settling (Petri-Dish)			Less Thru Ventilating		
	Floor Area (Sq. Ft.)	Ave. Conc. Per Day (MG/Sq. Ft./ Day)	Total Settled Per Day (g/Day)	Air Volume (CFM)	Ave. Conc. (g/m ³)	Total Carried Off (g/Day)
1st Floor Chem. Recovery Mech. Service	11,000	0.02	0.22	117000	0.04	0.190
	3,600	0.02	0.07	30000	0.07	0.086
2nd Floor Chem. Recovery Mech. Service	11,745	0.11	1.3	35900	1.7	2.5
	11,826	0.03	0.36	30000*	0.04	0.049
*Estimated	Totals			1.95		
				2.83		

714

BUREAU OF SPECIALLY TRAINED ANALYSTS

Specimen No. _____

Date _____ 2-25-46

Spectrographic Number _____ 875291

Field No. _____ 2438

Analytical Classification _____

Number of Specimens _____

Batch No. _____

Date of Collection _____

Ash from dust collected from inside walls of
the equip. of B. Cubicles.

Analyst _____ Mr. L. B. Smith 9906-2

Remarks _____

	M	M
Ag	M	m
	M	m
	M	m
	M	m
	M	m
	M	M
	M	M
		m

M = major constituent (In general, 1% or greater)
m = minor constituent (Appreciable amount present but
probably less than 1%.) L. Long

TABLE I

Air Concentrations found in various rooms
Bldg. 9706

Room	Date of Sample	Conc. mcg/m ³	Av. Conc. mcg/m ³
6	7-7-45	22	143
	7-8	226	
	7-8	171	
	7-13	193	
	7-13	104	
7	7-7	5	5
	7-7	5	
8	7-7	7	8
	7-7	9	
16	7-28	0.9	0.9
	7-28	0.7	
		1	
17	7-28	1	1
	8-3	1	
21	8-3	1	1
23	7-28	1	1
	8-3	1	
	8-4	1	
24	7-9	9	7
	7-12	7	
	7-17	6	
25	7-28	6	5
	7-31	5	
	8-4	4	
26	7-31	17	12
	7-31	6	

TABLE I. Cont.

Room	Date of Sample	Conc. mg/m ³	Av. Conc. mg/m ³
28	7-8-45	5	6
	7-12	7	
	7-17	14	
	7-18	3	
	7-23	2	
29	7-31	11	7
	7-31	2	
	8-4	5	
34	7-17	4	4
	8-4	4	
36	7-12	3	3
40	7-19	27	27
41	7-23	491	273
	7-25	55	
42	7-19	42	32
	7-23	21	
43	7-13	25	43
	7-13	95	
	7-14	8	
44	7-14	4	37
	7-16	72	
	7-16	89	
	7-18	6	
	7-20	16	
45	7-14	14	44
	7-14	14	
	7-16	105	
47	7-20	6	6
	8-7	5	
51	7-8	14	14
101	7-18	6	6
108	7-18	1	1

TABLE II

Losses of T per day through natural and mechanical
ventilation Building 9206

Room	Av. Conc. mcg/m ³	CFM Air leaving room	Loss of T gms/day
6	143	8700	50.8
7	5	2100	4.69
8	8	16000	5.21
16	1	11200	.46
17	1	14850	.61
21	1	7500	.31
23	1	6850	.28
24	7	7000	2.00
25	5	6490	1.33
26	12	3300	1.62
28	6	6800	1.67
29	7	3760	1.08
34	4	7150	1.17
36	3	8480	1.00
40	27	3200	3.53
41	273	1000	11.14
42	32	1000	1.31
43	43	7200	12.6
44	37	10350	15.6
45	44	7200	12.9
51	14	7860	4.49
101	6	4600	1.13
108	1	16520	.67
		total 169110	total 136.64
Av. mcg/m ³ 28			

TABLE III

Losses per day through Settling
Bldg. 9206

Room	Area of Room Sq. Ft.	No. Samples	Av. Amt. Settled mg/sq. ft./day	Total Loss of T gm/day
6	918	3	1.68	1.54
7	625	3	.337	.21
8	1925	5	.044	.085
16	730	6	.039	.029
17	1380	7	.036	.050
21	800	2	.004	.003
22	1024	3	.049	.050
23	800	4	.396	.316
25	1216	3	.90	1.09
26	600	7	.25	.15
28	1800	3	.048	.086
29	996	4	.21	.21
32	520	1	2.81	1.46
38	625	1	.026	.016
40	594	3	2.31	1.37
41	675	4	10.99	7.42
42	783	4	1.47	1.15
43	792	3	1.09	.86
44	900	3	.489	.44
51	1200	1	.025	.03
61	408	1	.092	.038
101	1000	1	.095	.095
108	850	4	.206	.175
TOTAL				16.87 gm.

TABLE IV

Test of Cottrell Precipitator
Bldg. 9206

Date

8-16-45

Location

Room 28

Cottrell #2

Measured air flow

300 CFM

Conc. T, mcg/m^3
air entering Cottrell

Conc. T, mcg/m^3
air leaving Cottrell

.2

Cottrell Efficiency

TUBALLOY DUST

Developments Since April, 1945

As work progressed in Alpha chemistry especially in Building 9202, it was seen from the results of dust analysis that high concentrations of Tuballoy compounds existed and little was being done to lower these concentrations. When Dr. DallaValle saw the situation and reviewed the results, it appeared to him as it had to us that large quantities of material were being carried away in the exhaust air. Since it was difficult to get whole-hearted cooperation in lowering dust levels purely from the medical standpoint, we decided to approach the problem from the standpoint of uneconomical operation. With this in mind a program was started in order to estimate the extent of the losses in the Alpha process buildings. Results of the survey were reported in the series of memorandums by Dr. DallaValle and the laboratory covering 9202 and 9201-1.

As work progressed in Alpha, it was seen that similar conditions were existing in the Beta buildings that quantities of much larger value were being lost there as well. A survey was then made of 9206 and the 9204 buildings. The results of the survey are reported in #G-3.200.1 "Survey and Recommendations, Building 9206".

Soon after making this report a meeting with management was held and the feasibility of Tuballoy recovery discussed. It was decided at this time that the Medical Division would continue to investigate the conditions existing in the remaining Beta buildings and would make some tests on recovery methods on a pilot

Tuballoy Dust 2

plant scale. Under Dr. DallaValle's direction, tests were made on a paper air filter utilizing a PL-24 unit in rotoclone fan. The results were reported in a lengthy report entitled "Pilot Scale Collection and Recovery of Air-Borne Tuballoy in Building 9206". This report not only covered the results of the 9206 experiments but also was a summary of all the analytical work and methods to date.

Another meeting was held with division heads of Chemistry and Engineering. However, no clear-cut decision was made regarding further work. Medical Division was to complete their surveys and work in close cooperation with the Engineering and Chemical Divisions in making further tests of collection equipment. Mr. Patterson by this time had appointed Mr. Alfred Schmidt to investigate the problem from the chemical standpoint. Mr. Schmidt went over our work carefully, ordered testing equipment and, pending its arrival, borrowed electrostatic precipitator and the Filter Queen for making further tests.

Present Status

Mr. Karl Frese of Engineering now has an electromatic filter unit loaned to TEC by the American Air Filter Corporation for further tests. He has not put the unit into operation as yet as approval has not been obtained on a work requisition written to cover further experimental work. Apparently the Army is now considering this requisition. When Mr. Frese has this unit in operation, the Medical Division will be called upon to make efficiency tests and offer advice on its installation and operation. Mr. Schmidt in the meantime has been making some

Tuballoy Dust 3

studies in 9206 and some of the Beta process buildings but so far has made no experiments on recovery equipment.

Analytical Methods

The analytical methods now in use for determining Tuballoy concentrations in the air is the Alpha count estimation of material collected on an asbestos base filter paper in the Filter Queen. The method is fully explained in the summary report mentioned above. Samples of settled dust have been determined by placing greased petri-dishes about the buildings and then washing them with CCl_4 extracting with 30% (by volume) HNO_3 and making fluorescent determinations of aliquots of the aqueous solution. The fluorescent determination is carried out in exactly the same manner as with present experiments (See Section 3 Technique in report on Fluoresometer, S B Smith and H G Neil).

Correlation of Dust Levels with Other Data

A report has been made through Dr. Sterner of all the dust measurements made in 9202 in order that he may relate these values to statistical findings from clinical data. Tuballoy urine concentrations have also been obtained on operating personnel in 9202. This data may be found in the tuballoy urine statistical file.

A similar report of dust levels in 9206 is contained in the report "Survey and Recommendations in 9206" mentioned above. A few more dust concentration results in 9206 are contained in the other report G-1.133.3.

Dust Data Files

Data sheets on individual samples can be found files under building number according to the date in the chemical dust sec-

Tuballoy Dust 4

tion. A few very early results are contained in Notebook
SBS #1.

December 21, 1944

Tentative Report
on

DUST CONCENTRATIONS IN THE CHEMICAL AREAS

Dust samples have been collected at various locations about the chemical area by means of the electro-static precipitator. These samples have been analyzed for T by two methods; polarographic analysis, and "alpha count". The accuracy of the alpha count method falls off in heavy concentrations. However, for small amounts of material both methods are accurate to at least 10%. Where the values are particularly high the limits of error will be given. The main source of error, however, is in the collection of the sample, which assumes 100% efficiency of the precipitator and an average rate of air flow through the precipitator of 3 cu. ft./ min.. The error here might be of the order of 25%. A few samples were collected simultaneously using two precipitators and one sample was analyzed polarographically while the other was analyzed by the alpha count method.

The samples analyzed polarographically were taken by means of the precipitator using glass collector tubes; those employing the alpha count procedure were taken by Lt. R. S. Wolf, UCED, on a similar instrument using stainless steel tubes lined with tinfoil. These tubes were shipped to Rochester for analysis.

BLD'G 9202

Bulk Treatment Department

Samples were taken on several different days and were analyzed by two methods. One sample, #1a, taken by Dr. Wolf showed the tremendous figure given below. This sample was taken close to an operator engaged in filling a container with oxide powder from an overhead hopper. The only precaution taken was a burlap bag wrapped about the end of the spout and the top of the container. Sample #2a was taken soon afterward in the laboratory on the second floor in the laboratory close to the center of the room. Windows were open and all the fans operating. Sample #6, the only sample showing a

BLD'G 9201-1

CHEMICAL RECOVERY AREA

Three samples were taken just after the afternoon shift change. The atmosphere appeared clear without noticeable fumes or dust. Samples #2 and #3 were collected at nose level close beside the operator at the cleaning table while using the rotary brush. The operator had neglected to turn on the suction system during the collection of ~~the~~ sample #2 but her attention was called to the fact before sample #3 was collected. The operator wore gloves but no safety glasses or respirator. Sample #4 was taken in the center aisle between the chemical recovery and mechanical service area close to the "D" washing rack nearest ^{the} cleaning table.

DATE	NO.	LOCATION	T CONCENTRATION BY POLAROGRAPH
5/12/44	2	Cleaning table, no exhaust	0.45 mg/m ³
"	3	" " , exhaust in operation	0.12 mg/m ³
"	4	General atmosphere in center aisle	0.06 mg/m ³

S.B. Smith

DOCUMENT DESCRIPTION (Completed By Requesting Division)

Document No.

Author's Telephone No.

Acct. No.

Date of Request

3,200.1

6-0263

2366000 3

5/25/95 2418

Unclassified Title:

SURVEY AND RECOMMENDATIONS FOR BUILDING 9206,
INTERNAL CORRESPONDENCE (AUGUST 21, 1945)

Author(s) Requestor: Steve Wiley

TYPE: ☐ Formal Report ☐ Informal Report ☐ Progress/Status Report ☐ Co-Op Report ☐ Thesis/Term Paper

☐ Oral Presentation (Identify meeting, sponsor, location, date):

☐ Journal Article (Identify Journal):☒ Other (Specify): To Be Released to ChemRisk, Phase IIDocument will be published in proceedings ☒ No ☐ YesDocument will be distributed at meeting ☒ No ☐ YesDocument has patent or invention significance ☐ No ☐ Yes (Identify)Document has been previously released ☒ No ☐ Yes (Reference)

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TECHNICAL CLASSIFICATION REVIEW (Divisional Classification Representative)

Title(s): LL Abstract: NA

DOCUMENT: Level LL Category NA

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DOCUMENT:

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MEMORANDUM

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TO Dr. J. H. Sterner

DATE Report No. G-3,200.1
August 21, 1945

SUBJECT SURVEY AND RECOMMENDATIONS - BLDG. 9206

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I am appending to this memorandum all data thus far obtained in our investigations of T-concentrations, and air movements in the above building. Parts of the data are of immediate interest and attention is directed to the recommendations made at the end of this memorandum.

The pattern of study followed is that discussed in my last report relative to findings in Bldg. 9202. As suggested by you, I have directed particular attention to ventilation from both health and T-recovery aspects. In most essentials the study is as we discussed it should be some weeks ago following our conference with Dr. McNally and Mr. Warren.

Since presenting my report on Bldg. 9202, the recovery problem has loomed more and more important. Several departments on the area have contacted us, and interest has centered on our findings and recommendations. What has thus far been done exemplifies forcibly the value of industrial hygiene in furnishing general information on environmental conditions. It so happens in this case that the T found in the air of various buildings on the area is not only important to us in gauging the extent of our health problems, but also directly contributes to our knowledge of losses. Similarly the remedy for either problem is the same.

You will recall our discussions on the ventilation of certain buildings, that no recommendations should be made until the recovery of T could be established as important. In other words, ventilation could not be disassociated from T recovery. The reason is simple, for on one hand if collection proved unimportant, we could, from our standpoint, rely on air dilution or general ventilation. On the other hand, if T recovery proved important, then local exhaust should be recommended. I shall discuss later what our procedures in this matter have been, and the end results we hope to achieve.

As in earlier reports made to you, I am indebted to you for much advice and to the following for assistance in carrying out our field investigations: Mr. Stanton Smith, Mr. William MacPherson, Mr. William Dresser and Mr. R.J. Schrader. The two latter gentlemen are not members of your staff, but nevertheless, cooperated in the work at hand. Mr. A. Dahl "Counted" the samples collected.

RESULTS

T-Concentrations. There is presented in Tables 1 and 2 data pertaining to sampling. It will be seen, especially in Table 2 that the concentrations in the individual rooms are relatively low (as compared, for example, with Bldg. 9202). However, due to the large amount of air leaving the building, the total losses per day amount to about 135 grams T per day. It will further be observed from the data that some 75 percent is contributed by five rooms. I list these below:

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MEMORANDUM

G-3.200.1

TO Dr. J. H. SternerDATE August 21, 1945SUBJECT SURVEY AND RECOMMENDATIONS - BLDG. 9206

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-2-

Room	Percent Total Airborne T
6	37.3
44	11.4
45	9.4
43	9.2
41	8.2
Total	<u>75.5</u>

As regards rooms 43-45 which are called reconversion rooms, it is difficult to locate the cause of the losses found. The systems are closed systems, so that it is probable that either undetected leaks occur, or else in over-hauling or repairing equipment, sufficient T is lost to persist for some time. The rooms are air-conditioned, and a certain amount of air recirculated, so that there may be a build-up of T concentrations due to this cause. However, in the computations here reported, I have concerned myself only with air leaving the rooms in question.

Room 41 contains calciners, and the concentration recorded is easily understood.

The condition in room 6 is of especial interest. The concentrations found are the highest in any part of the building. Some of the material undoubtedly comes from carbon burning, but by far the greatest portion comes from breaking up carbon plates. This operation is carried on over the mouth of an open metal barrel. The method used for breaking the carbon is conducive not only to dust from lines of fracture, but from the carbon surface as well. The smart blow given to crack the carbon vibrates the carbon surface, and undoubtedly releases therefrom a certain amount of T. I might mention that tests made since Table 1 was prepared indicate that the concentrations recorded persist.

In passing, I desire to point out that I have tested one Cottrell unit and found it to be about 93 percent efficient. The total loss per unit is estimated to be 1.1 g. T per day. This loss has not been added to the total above given. The average air flow through the Cottrell tested was about 300 cfm. Undoubtedly losses from the Cottrells are higher than the estimate made, for the method of operating the carbon burning units to which they are attached is not altogether satisfactory from a loss standpoint.

RECOMMENDATIONS

Methods for carrying out the recommendations here made are now being studied. What is being done forms the subject of the next section.

~~SECRET~~

~~SECRET~~

MEMORANDUM

G-3-200.1

TO Dr. J. H. Sterner

DATE August 21, 1945

SUBJECT SURVEY AND RECOMMENDATIONS - BLDG. 9206

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-3-

1. Carbon breaking should be carried out in a ventilated enclosure provided with a suitable means for collecting the dust created.
2. Carbon burning units should be placed in ventilated enclosures and provided with suitable means for collecting all fumes and dust given off during changing and emptying operations.
3. Redesign hoods on calciners in Room 41 so that more air is handled by them, thus preventing better the escape of any T.
4. Redesign ventilating system in Rooms 43-45 so that all air removed or recirculated in the room is passed through a collector to remove T.
5. While it does not seem within our province to recommend operational matters, it does seem in order--provided the economics of recovery warrant--that research be done on the area with regard to handling carbon and burning it. This may, of course, already be under way.

PROGRAM

I have discussed the recovery and ventilation problem with all departments concerned with these items. At a meeting held on August 18 in which all interested departments were represented, it was decided to turn over to us the study of the best means available for recovering T, and the type of ventilation to be proposed.

This program is now under way, and we have procured necessary equipment for studying precisely what is needed. At the moment we are considering special paper filters as a collecting surface, but other methods will also be studied. In this work we are being assisted by Dr. H. L. Hull's department. I might state that aside from the problem of securing an efficient collecting method, we must also consider such matters as ease of reprocessing collected dust and the general economics of maintenance.

At the same time our pilot plant study proceeds we are able to investigate the best type of ventilation needed on a given job.

~~SECRET~~

~~SECRET~~
MEMORANDUM

TO Dr. J. H. SternerDATE August 21, 1945SUBJECT SURVEY AND RECOMMENDATIONS - BLDG. 9206

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-4-

In closing, I am glad to say that the general program has now developed that no longer are we so much concerned with matters of existing T concentrations (though ever important) but with the provision of necessary safeguards.

J. M. DallaValle -

VC

Distribution:

Series A

1. Dr. J.H. Sterner
2. Dr. J.G. McNally
3. " " "
4. Mr. L.G. Warren
5. " " "
6. *Capt* " "

Series B

1. Lt. Col. Ruhoff
2. " " "
3. *Capt Louis Goffe*
4. Dr. H.L. Hull
5. " " "
6. Mr. S.B. Smith
7. Mr. Oran Miller
(TEC Reports Office)

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TABLE I

Air Concentrations found in various rooms
Bldg. 9706

Room	Date of Sample	Conc. mcg/m ³	Av. Conc. mcg/m ³
6	7-7-45	22	143
	7-8	226	
	7-8	171	
	7-19	199	
	7-19	104	
7	7-7	5	5
	7-7	5	
8	7-7	7	8
	7-7	9	
16	7-28	0.9	0.9
	7-28	0.7	
17	7-28	1	1
	8-1	1	
21	8-3	1	1
23	7-28	1	1
	8-1	1	
	8-4	1	
24	7-9	7	7
	7-12	7	
	7-17	6	
25	7-28	6	5
	7-31	5	
	8-4	4	
26	7-31	17	12
	7-31	8	

TABLE I Cont.

Room	Date of Sample	Conc. mcg/m ³	Av. Conc. mcg/m ³
28	7-8-45	5	6
	7-12	7	
	7-17	14	
	7-18	3	
	7-23	2	
29	7-31	11	7
	7-31	2	
	8-4	5	
34	7-17	4	4
	8-4	4	
36	7-12	3	3
40	7-19	27	27
41	7-23	491	273
	7-25	55	
42	7-19	42	32
	7-23	21	
49	7-13	23	13
	7-13	8	
	7-14	8	
44	7-14	4	37
	7-16	72	
	7-16	89	
	7-18	16	
	7-20	16	
45	7-14	14	14
	7-14	14	
	7-16	105	
47	7-20	6	6
	8-7	3	
51	7-8	14	14
101	7-18	6	6
108	7-18	1	1

TABLE II

Losses of T per day through natural and mechanical
ventilation Building 9206

Room	Av. Conc. mcg/m ³	CFM Air Leaving room	Loss of T gms/day
6	143	8700	50.8
7	5	2100	4.69
8	8	16000	5.21
16	1	11200	.46
17	1	14850	.61
21	1	7500	.31
23	1	6850	.28
24	7	7000	2.00
25	5	6490	1.33
26	12	3300	1.62
28	6	6800	1.67
29	7	3760	1.08
34	4	7150	1.17
36	3	8480	1.00
40	27	3200	3.53
41	273	1000	11.14
42	32	1000	1.31
43	43	7200	12.6
44	37	10350	15.6
45	44	7200	12.9
51	14	7860	4.49
101	6	4600	1.13
108	1	16520	.67
		Total 169110	Total 136.64
Av. mcg/m ³ 28			

TABLE III

Losses per day through Settling
Bldg. 9206

Room	Area of Room Sq. Ft.	No. Samples	Av. Amt. Settled mg/sq. ft./day	Total Loss of T. mg/day
6	918	3	1.68	1.51
7	625	3	.337	.21
8	1925	5	.044	.083
16	730	6	.039	.223
17	1980	7	.036	.250
21	800	2	.004	.003
22	1024	3	.049	.030
23	800	4	.396	.326
25	1216	3	.90	1.03
26	600	7	.25	.28
28	1800	3	.048	.036
29	996	4	.21	.036
32	528	1	2.81	1.14
38	525	1	.026	.026
40	524	2	.31	.036
41	675	4	10.99	7.78
42	783	4	1.47	1.10
43	782	3	1.09	.82
44	286	3	.489	.37
51	1200	1	.025	.025
61	408	1	.092	.092
101	1000	1	.095	.095
108	510	1	.206	.206

TOTAL

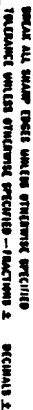
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TABLE IV

Test of Cottrell Precipitator
Bldg. 9206

Date	8-16-45
Location	Room 28
	Cottrell #2
Measured air flow	300 CFM
Conc. T, mcg/m ³ air entering Cottrell	2500
Conc. T, mcg/m ³ air leaving Cottrell	200
Cottrell Efficiency	92.6%

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CLINTON ENGINEER WORKS
TENNESSEE EASTMAN CORPORATION
OAK RIDGE, TENNESSEE

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